

**AN OVERVIEW OF THE OFFICE  
OF COMMERCIAL SPACE TRANSPORTATION'S  
BUDGET FOR FISCAL YEAR 2013**

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**HEARING**  
BEFORE THE  
SUBCOMMITTEE ON SPACE AND AERONAUTICS  
COMMITTEE ON SCIENCE, SPACE, AND  
TECHNOLOGY  
HOUSE OF REPRESENTATIVES  
ONE HUNDRED TWELFTH CONGRESS

SECOND SESSION

TUESDAY, MARCH 20, 2012

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**AN OVERVIEW OF THE OFFICE OF  
COMMERCIAL SPACE TRANSPORTATION'S  
BUDGET FOR FISCAL YEAR 2013**

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**TUESDAY, MARCH 20, 2012**

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON SPACE AND AERONAUTICS  
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,  
*Washington, D.C.*

The Subcommittee met, pursuant to call, at 10:03 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Steven Palazzo [Chairman of the Subcommittee] presiding.

RALPH M. HALL, TEXAS  
CHAIRMAN

EDDIE BERNICE JOHNSON, TEXAS  
RANKING MEMBER

U.S. HOUSE OF REPRESENTATIVES  
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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Subcommittee on Space and Aeronautics

*An Overview of the Office of Commercial Space Transportation's Budget for Fiscal Year 2013*

Tuesday, March 20, 2012  
10:00 a.m.-12:00 p.m.  
2318 Rayburn House Office Building

Witnesses

**Dr. George C. Nield**

*Associate Administrator for Commercial Space Transportation of the Federal Aviation  
Administration*

**CAPT Wilbur C. Trafton, USN (Ret)**

*Chairman, Commercial Space Transportation Advisory Committee*



**SUBCOMMITTEE ON SPACE AND AERONAUTICS  
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY  
U.S. HOUSE OF REPRESENTATIVES**

**Office of Commercial Space Transportation  
Fiscal Year 2013 Budget Request**

Tuesday, March 20, 2012  
10:00 a.m. – 12:00 p.m.  
2318 Rayburn House Office Building

**Purpose**

The purpose of the March 20 hearing is to review the Fiscal Year 2013 budget request submitted by the FAA Office of Commercial Space Transportation (in FAA shorthand the office is referred to as ‘AST’) and to examine the office’s roles and responsibilities as the commercial market is poised to expand. AST’s FY2013 budget request seeks \$16.700 million, a 2.6% increase over the FY2012 enacted level (\$16.271 million). Based on industry provided launch manifests, AST forecasts 40 commercial launch and reentry operations in 2012, compared with only one licensed launch in FY2011. More detail on the launch forecast will be discussed later.

**Witnesses**

**Dr. George C. Nield**, Associate Administrator for Commercial Space Transportation, Federal Aviation Administration

**Capt. Wilbur C. Trafton (USN Ret.)**, Chair, Commercial Space Transportation Advisory Committee (COMSTAC)

**FY2012 Budget Request**

FAA Office of Commercial Space Transportation (AST)

FY11 Actual	FY12 Enacted	FY13 Request	FY12 vs. FY13 Change	FY12 vs. FY13 Percent Increase
\$15,021,000	\$16,271,000	\$16,700,000	+\$429,000	+2.6%

AST’s FY13 budget request seeks \$16.700 million, a 2.6% increase over the FY12 enacted budget.

The FY13 budget justification states: *“The increased activity levels in the commercial space industry creates a factor of six increase in the corresponding number of licenses evaluated and issued, environmental assessments, safety analyses, and safety inspections for AST staff. To meet*

*these increased workload demands, AST will use the additional funds to augment our existing staff by employing up to ten safety experts through contract mechanisms. This will allow AST to double the number of our staff assigned to operational safety oversight function in our field offices, and also to increase the number of simultaneous safety analyses we can perform.”*

### **Background**

The Office of Commercial Space Transportation (AST) licenses and regulates U.S. commercial space launches and reentries, as well as the operation of non-federal launch and reentry sites. Its mission statement is: “To ensure the protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch and reentry activities, and to encourage, facilitate, and promote U.S. commercial space transportation.” All space launches and reentries by U.S. citizens except those conducted by the U.S. Government (or on its behalf) require a license from AST. AST issued its first launch license in 1989 and since then has licensed 205 launches with no fatalities, serious injuries, or significant damage to the uninvolved public.

In 1984 President Reagan signed an executive order designating the Department of Transportation as the lead federal agency for encouraging and facilitating commercial launch activities within the private sector. Eight months later Congress passed the Commercial Space Launch Act (P.L. 98- 575) which gave legislative authority to DOT’s role as the principal oversight agency for the regulation and licensing of commercial space transportation systems. Subsequently, DOT shifted the office to the FAA.

Congress last produced legislation dealing with commercial space transportation in the 108<sup>th</sup> Congress. Two bills were enacted: (1) “The Commercial Space Launch Amendments Act”, H.R. 5382 (PL 108-492) was introduced by Rep. Dana Rohrabacher and expanded AST’s authority to regulate commercial human space flight; (2) H.R. 2608 (PL 108-360) reauthorized the Office of Commercial Space Transportation through FY 2009.

More recently, on February 14, 2012 the President enacted the FAA Modernization and Reform Act of 2012 (PL 112-95) that included a provision extending a moratorium on AST issuing regulations for commercial human spaceflight. (More on this will be discussed below.)

Because commercial entities typically launch from military bases, AST works with both the Air Force and the commercial industry to develop common launch safety requirements at Air Force launch sites. AST also collaborates with the FAA to ensure that future commercial space transportation requirements are integrated into the Next Generation Air Transportation System (NextGen).

### *Licensing Activities*

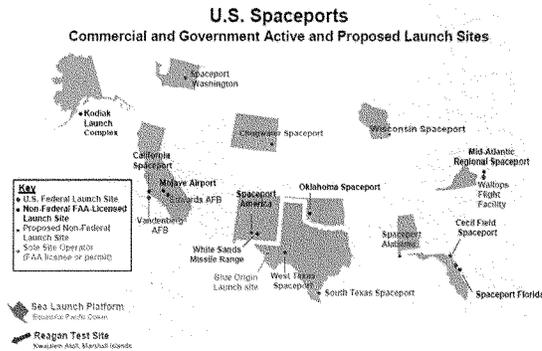
There are three types of launches – national security, civil, and commercial. The Office of Commercial Space Transportation regulates commercial launches; launches of NASA and DOD payloads do not require licenses. In 2010, AST licensed four commercial orbital launches compared to five licensed launches in 2009. For 2011 AST licensed just one commercial launch. No suborbital flights were conducted under FAA experimental permits in 2010 or 2011.

In 2010 one reentry was conducted under an FAA reentry license. The Space Exploration Technologies Corp (SpaceX) Dragon Capsule successfully reentered the atmosphere and landed in the Pacific Ocean following its first NASA Commercial Orbital Transportation System (COTS) demonstration flight. It was the first reentry license ever granted by FAA. SpaceX anticipates flying its second COTS demonstration flight later this spring and Orbital Science Corporation (Orbital) also plans to fly its first COTS demonstration before the end of summer. Pending successful completion of the demonstration flights, both companies could begin regular ISS cargo resupply flights by year's end.

### *Spaceports*

In addition to licensing launches, AST also licenses the operation of commercial launch sites (or "spaceports"). Currently, there are eight non-federal FAA-licensed launch sites, listed below and highlighted on the following chart.

- Spaceport Florida, Cape Canaveral Air Force Station, FL
- Mid-Atlantic Regional Spaceport, Wallops Island, VA
- California Spaceport, Vandenberg Air Force Base, CA
- Kodiak Launch Complex, Kodiak Island, AK
- Mojave Air & Space Port, CA
- Cecil Field Spaceport, Jacksonville, FL
- Oklahoma Spaceport, Burns Flat, OK
- Spaceport America, Las Cruces, NM



*Commercial Space Launch Amendments Act of 2004*

In 2004, SpaceShipOne successfully launched two suborbital flights from the Mojave, CA, airport within a two week time-span, winning the \$10 million Ansari X-Prize. Space industry optimists believed then that suborbital flights carrying space tourists would quickly develop with several commercial companies entering the marketplace to offer routine suborbital flights. Later that year Congress passed H.R. 5382 (P.L. 108-492), the Commercial Space Launch Amendments Act of 2004, authorizing the Secretary of Transportation to license and regulate commercial human space flight.

Even though the Act extended regulatory new authorities to DOT (specifically to the Office of Commercial Space Transportation), it prohibited federal regulation of commercial human space flight companies – operating either suborbital or orbital commercial launch systems – for eight years following enactment.

The premise of the prohibition was rooted in the concern that the industry did not yet exist, thus DOT (and AST) had no relevant experience upon which to regulate industry practices. During this period, it was anticipated that space launch companies would experiment with various designs and processes as they endeavored to develop vehicles and demonstrate their safety and performance capabilities prior to offering licensed suborbital (or orbital) flights. The Act provided two exceptions to the regulatory prohibition; AST could restrict or prohibit design features or operating practices that (1) resulted in a serious or fatal injury to crew or space flight participants, or (2) contributed to an unplanned event during a commercial human space flight that posed a high risk of causing a serious or fatal injury to crew or space flight participants. The eight year ban was due to expire on December 23, 2012 but was extended to October 1, 2015, as the companies that are developing these systems have experienced test flight delays.

To date only one company, Virgin Galactic, is known to be actively testing a prototype sub-orbital commercial human spaceflight vehicle. SpaceShipTwo, a larger version of the Ansari X-Prize winner, continues to undergo unpowered atmospheric testing in California. According to the company, hundreds of interested purchasers have already placed down-payments with Virgin Galactic for the privilege of flying on their spacecraft once commercial flights get underway.

*NASA's Commercial Cargo and Crew Programs*

With the retirement of the Space Shuttle in 2011, NASA plans to rely on two companies – Orbital and SpaceX – to provide cargo resupply services to the International Space Station. Each company has a contract through the middle part of this decade, and agency officials anticipate acquiring additional cargo services to service ISS to 2020. Under the current contracts, each company is obligated to launch two supply flights a year, and with regard to SpaceX, it would also bring materials back from ISS using their Dragon capsule to reenter the atmosphere and land

at a permitted site. For these resupply flights NASA is buying a service as though it were a traditional commercial customer, thus triggering coverage under AST's licensing regime. Once both companies are operating resupply flights on a routine basis, AST's regulatory workload will increase by four flights a year, plus two reentries.

NASA is also pursuing a longer term strategy to use a similar approach of buying launch services to ferry astronauts to and from the International Space Station. NASA released an Announcement for Proposals on Feb. 7 inviting aerospace companies to submit bids by March 23 to compete for funding under the Commercial Crew Integrated Capability (CCiCap) initiative. While the programmatic timeline for CCiCap and actual follow-on contracts to deliver crew to ISS remain notional, this latest approach to stimulate potential "commercial crew" providers anticipates flights to the ISS as early as 2017.

Non-NASA crewed flights would also require a new set of regulations be established and enforced by AST to ensure that the risk to non-governmental crew and passengers are minimized. NASA has vast experience in human spaceflight while AST has none.

The AST FY13 budget justification states: *"Operational safety oversight of human spaceflight will require developing technical expertise in several new areas including environmental control, life support, and crew survivability. To date, AST's launch safety oversight experience and authority has been primarily focused on unmanned launches of satellites into orbit using expendable launch vehicles."*

FAA (AST) and NASA are in discussions now to establish how the two agencies will exercise oversight and insight into the design and operation of any commercial orbital and suborbital crew launch systems, their respective certification and regulation roles, as well as understanding the reentry performance, landing sites, and recovery operations proposed by the companies. The goal is to minimize any overlap between the agencies.

#### ***Center of Excellence for Commercial Space Transportation***

In 1990, Congress granted authority to the FAA Administrator to make grants to one or more colleges or universities to establish and operate several regional centers of air transportation excellence (PL 101-508, Sec. 9209). Each center of excellence would be responsible for 50 percent of the costs of establishing and operating the center of excellence, with the federal government responsible for the other 50 percent.

The purpose of each Center of Excellence (COE) is to advance the state of transportation knowledge within a particular area of concentration. This is accomplished by providing both an educational and research component to enable the next generation in the field of transportation and by conducting high quality research to generate significant advances in transportation science and technology. Furthermore, each COE is responsible for disseminating research results to enable technology transfer into the commercial sector where appropriate.

In August 2010, the FAA established the COE for Commercial Space Transportation (COE-CST) led by New Mexico State University in Las Cruces to tackle research in areas such as space launch operations and traffic management; launch vehicle systems, payloads, technologies, and operations; commercial human space flight; and space commerce. Partner colleges and universities include: Stanford University in California, the Florida Institute of Technology in Melbourne, the New Mexico Institute of Mining and Technology in Socorro, the Florida Center for Advanced Aero-Propulsion at Florida State University in Tallahassee, the University of Colorado at Boulder, and the University of Texas Medical Branch at Galveston.

The budget request for the COE-CST is \$1.0 million.

Chairman PALAZZO. The Subcommittee on Space and Aeronautics will come to order.

Good morning. Welcome to today's hearing entitled "An Overview of the Office of Commercial Space Transportation's Budget for Fiscal Year 2013." In front of you are packets containing the written testimony, biographies and Truth in Testimony disclosures for today's witness panel. At this time I recognize myself for five minutes for an opening statement.

Welcome to today's hearing on the President's 2013 budget request for the FAA Office of Commercial Space Transportation. I want to thank our witnesses, Dr. George Nield and Captain Wilbur Trafton, for joining us. I know that many people put in a lot of effort preparing for these hearings, and we appreciate you taking time from your busy schedules to appear before the Subcommittee. I also want to assure you that we greatly value your expertise and wisdom, and your testimony will benefit this Committee in the weeks and months ahead as we endeavor to better improve the policies that will guide our Nation's evolving commercial space program.

The Office of Commercial Space Transportation, known as AST, has successfully licensed over 200 launches since 1984 without loss of life, serious injury or property damage to the general public, which is a notable record in this inherently risky business. AST's mission is to ensure the protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch or reentry activities.

Currently, AST has 14 active launch licenses and eight spaceport licenses, and is working with SpaceX and Orbital Sciences for the upcoming NASA COTS and Commercial Resupply Services missions. Additionally, AST is coordinating with NASA for licensing the Suborbital Flight Opportunities Program as well as working toward the day when commercial crew demonstration flights will begin.

The AST budget proposal for fiscal year 2013 includes a two percent increase, which is intended to allow AST to double the number of staff in field offices in anticipation of potentially up to 40 launch and reentry operations in 2013. This significant increase reflects several launches for ISS cargo resupply, and long-anticipated flights in the suborbital tourism market.

The recently passed FAA reauthorization bill includes an extension of the regulatory moratorium on commercial human spaceflight systems to October 2015. It is my hope that FAA will use this time to engage with industry stakeholders on its regulatory approach and licensing standards to prepare the path forward for a proposed rulemaking. It is also critical that a delineation of roles and responsibilities among FAA's various offices be clearly articulated to ensure that industry won't be hindered by duplication or ambiguous requirements.

With these developments in mind, I do have some concerns with NASA's use of Space Act Agreements inasmuch as they cannot impose safety requirements on program participants. And considering that FAA will not be able to promulgate human spaceflight regulations for several years, I realize that AST has a significant amount of work ahead as it endeavors to align its regulatory approach with

evolving industry approaches to safety, all the while having to comply with the moratorium. We will be closely monitoring the collaboration between FAA and NASA in this area to ensure these agencies avoid conflicting or duplication of responsibilities while balancing authority for commercial space operations on NASA missions.

I am pleased to note that AST is working closely with range partners at the Wallops Flight Facility, the U.S. Air Force at the Eastern and Western Ranges, and NASA offices at Johnson Space Center and Kennedy. These relationships help accomplish our national objectives to further NASA priorities with commercial space industry support.

AST also carries the dual mission to encourage, facilitate and promote the U.S. commercial space transportation industry. While I trust that safety is the highest priority for this agency, I would like to better understand how AST balances this dual mission. This is especially important when evaluating the responsibility that AST shares with the Aviation Safety branch of the FAA on newly developed hybrid vehicles that will share the National Airspace System with transport and general aviation aircraft.

The AST budget also proposes funding for the Center of Excellence for Commercial Space Transportation. Described as a cost-sharing partnership of academia, industry and government entities focusing on research of primary interest to AST and U.S. commercial space industry, the Center of Excellence is a consortium of eight universities. While it has been funded for the past two years from the FAA's R&D account, AST now plans to include this \$1 million operation to its base budget. I am happy to see this office engage with the best and brightest minds in our universities, and I look forward to learning more about research projects, outcomes and contributions the consortium is achieving to help advance the role of commercial space.

As I close, I would like to commend Dr. Nield and his agency on AST's impressive safety record. While I understand that AST's core business operations focus on maintaining this record, there are numerous challenges ahead as the industry anticipates a period of high growth. Keeping in mind interagency coordination, budgets, the vagueness of the marketplace, and an eager emergent industry, the upcoming years are sure to offer exciting innovations as we work to maintain U.S. leadership in space.

[The prepared statement of Mr. Palazzo follows:]

PREPARED STATEMENT OF SUBCOMMITTEE CHAIRMAN STEVEN M. PALAZZO

Good morning and welcome to today's hearing on the President's 2013 budget request for the FAA Office of Commercial Space Transportation. I want to thank our witnesses, Dr. George Nield and Cpt. Wilbur Trafton, for joining us. I know that many people put in a lot of effort preparing for these hearings, and we appreciate you taking time from your busy schedules to appear before the Subcommittee. I also want to assure you that we greatly value your expertise and wisdom, and your testimony will benefit this Committee in the weeks and months ahead as we endeavor to better improve the policies that will guide our nation's evolving commercial space program.

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The recently passed FAA reauthorization bill includes an extension of the regulatory moratorium on commercial human spaceflight systems to October 2015. It is my hope that FAA will use this time to engage with industry stakeholders on its regulatory approach and licensing standards to prepare the path forward for a proposed rulemaking. It is also critical that a delineation of roles and responsibilities among FAA's various offices be clearly articulated to ensure that industry won't be hindered by duplicative or ambiguous requirements.

With these developments in mind, I do have some concerns with NASA's use of Space Act Agreements inasmuch as they cannot impose safety requirements on program participants. And considering that FAA will not be able to promulgate human spaceflight regulations for several years, I realize that AST has a significant amount of work ahead as it endeavors to align its regulatory approach with evolving industry approaches to safety, all the while having to comply with the moratorium. We will be closely monitoring the collaboration between FAA and NASA in this area to ensure these agencies avoid conflicting or duplicative responsibilities while balancing authority for commercial space operations on NASA missions.

I am pleased to note that AST is working closely with range partners at the Wallops Flight Facility, the US Air Force at the Eastern and Western Ranges, and NASA offices at Johnson Space Center and Kennedy. These relationships help accomplish our national objectives to further NASA priorities with commercial space industry support.

AST also carries the dual mission to "encourage, facilitate and promote" the U.S. commercial space transportation industry. While I trust that safety is the highest priority for this agency, I would like to better understand how AST balances this dual mission. This is especially important when evaluating the responsibility that AST shares with the Aviation Safety branch of the FAA on newly developed hybrid vehicles that will share the National Airspace System with transport and general aviation aircraft.

The AST budget also proposes funding for the Center of Excellence for Commercial Space Transportation. Described as a cost sharing partnership of academia, industry and government entities focusing on research of primary interest to AST and US commercial space industry, the Center of Excellence is a consortium of eight universities. While it has been funded for the past two years from the FAA's RE&D account, AST now plans to include this 1 million dollar operation to its base budget. I am happy to see this office engage with the best and brightest minds in our universities, and I look forward to learning more about research projects, outcomes and contributions the consortium is achieving to help advance the role of commercial space.

As I close, I'd like to commend Dr. Nield on AST's impressive safety record. While I understand that their core business operations focus on maintaining this record, there are numerous challenges ahead as the industry anticipates a period of high growth. Keeping in mind interagency coordination, budgets, the vagaries of the marketplace, and an eager emergent industry, the upcoming years are sure to offer exciting innovations as we work to maintain US leadership in space. I now recognize Ranking Member Jerry Costello, for his opening statement.

Chairman PALAZZO. I now recognize our Ranking Member, Jerry Costello, for his opening statement.

Mr. COSTELLO. Mr. Chairman, thank you, and Mr. Chairman, I thank you for holding today's hearing to review the fiscal year 2013 budget request for the FAA's Office of Commercial Space Transportation.

The successful growth of commercial human spaceflight activities can open new opportunities for commercial space. However, real-

izing and sustaining the promise of that industry will require close attention to safety.

As Ranking Member of the Committee on Transportation and Infrastructure, the Subcommittee on Aviation, I have a great appreciation, I think, for the expectations of the flying public. The public needs a clear understanding of the risks involved with commercial space transportation, and it will need to be convinced those risks are being effectively managed.

AST will be at the center of establishing those expectations, as it will have a critical role in ensuring the safety of would-be space tourists, and potentially even of NASA astronauts or other spaceflight participants.

Although commercial human spaceflight vehicles are in varying stages of design and development, important policy questions have yet to be resolved. To name a few: How will safety regulations be developed? Two, will the government extend liability protection to the new industry? Three, how will the safety of commercial operations on orbit be managed? And is AST's role as both a regulator and promoter of the commercial spaceflight industry, is that an appropriate role for the agency?

Mr. Chairman, I hope this is the first of many discussions that Congress and the FAA and key stakeholders will have to address these important policy issues. I look forward to hearing from the Associate Administrator on the challenges facing the AST and what actions, if any, are needed to help address those challenges.

In addition, I am interested in hearing the perspectives on AST's roles and responsibilities, especially in light of his past experience in leading NASA's human spaceflight activities. I am very interested in hearing Captain Trafton's perspective on these issues.

Mr. Chairman, I thank you for yielding the time to me and I look forward to hearing the testimony of our witnesses, and certainly I have some questions for them after their testimony.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF ACTING RANKING MEMBER JERRY F. COSTELLO

Mr. Chairman, thank you for holding today's hearing to review the Fiscal Year 2013 (FY13) budget request for the Federal Aviation Administration's (FAA's) Office of Commercial Space Transportation (AST).

The successful growth of commercial human spaceflight activities can open new opportunities for commercial space, and I think we all hope for a vibrant future for the industry.

However, realizing and sustaining the promise of that industry will require close attention to safety.

As Ranking Member of the Transportation and Infrastructure's Subcommittee on Aviation, I have a good appreciation of the expectations of the flying public.

The public needs a clear understanding of the risks involved with commercial space transportation, and it will need to be convinced those risks are being effectively managed.

FAA's Office of Commercial Space Transportation—AST—will be at the center of establishing those expectations, as it will have a critical role in ensuring the safety of would-be space tourists, and potentially even of NASA astronauts or other spaceflight participants.

Although commercial human spaceflight vehicles are in varying stages of design and development, important policy questions have yet to be resolved. To name a few:

*How will safety regulations be developed?*

- *Will the Government extend liability and indemnification protection to the new industry?*

- *How will the safety of commercial operations on-orbit be managed?*
- *Is AST's role as both a regulator and promoter of the commercial spaceflight industry still appropriate?*

Mr. Chairman, I hope this is the first of many discussions that Congress, the FAA, and key stakeholders will have to address these important policy issues.

I look forward to hearing from Associate Administrator Nield on the challenges facing the AST and what actions, if any, are needed to help address those challenges.

In addition, I am interested in hearing Mr. Trafton's perspectives on AST's roles and responsibilities, especially in light of his past experience in leading NASA's human spaceflight activities.

Thank you, Mr. Chairman, and I yield back the balance of my time.

Chairman PALAZZO. Thank you, Mr. Costello.

If there are Members who wish to submit additional opening statements, your statements will be added to the record at this point.

At this time I would like to introduce our panel of witnesses, and then we will proceed to hear from each of them in order.

Our first witness is Dr. George Nield, Associate Administrator for Commercial Space Transportation at the Federal Aviation Administration. Dr. Nield is a graduate of the U.S. Air Force Academy and has over 30 years of aerospace experience with the Air Force, NASA and in private industry. Dr. Nield came to FAA from the Orbital Sciences Corporation, where he served as Senior Scientist for the Advanced Programs Group.

Next, we will hear from retired United States Navy Captain Wilbur Trafton, who is Chairman of the Commercial Space Advisory Committee. Captain Trafton is a graduate of the U.S. Naval Academy. He served 26 years in the Navy, flying combat missions in Southeast Asia and serving in command positions. He also has extensive experience in industry and served as Associate Administrator for Spaceflight at NASA. Captain, thank you for joining us this morning.

Thanks again to everybody here, and as our witnesses should know, spoken testimony is limited to five minutes each. After all witnesses have spoken, Members of the Committee will have five minutes each to ask questions.

I now recognize as our first witness, Dr. George Nield, to present his testimony.

**STATEMENT OF DR. GEORGE C. NIELD,  
ASSOCIATE ADMINISTRATOR FOR COMMERCIAL SPACE  
TRANSPORTATION OF THE FEDERAL AVIATION  
ADMINISTRATION**

Dr. NIELD. Chairman Palazzo, Ranking Member Costello and distinguished Members of the Committee, thank you for inviting me to meet with you today to update you on the ongoing activities in commercial space transportation by the Federal Aviation Administration and on some of the recent developments in the industry.

With NASA's retirement of the space shuttle, we are undergoing a historic change in the U.S. space program. The final mission of Atlantis in July of last year left many wondering about the future of space transportation in this country. While it is certainly true that the launch marked the end of an era, it also represented the beginning of what I am confident will be an exciting future for our Nation in space. Today, I would like to give you my perspective on

that future and to highlight some of the ways that the FAA and the commercial space transportation industry are dealing with the challenges that we will be facing in the years ahead.

The FAA Office of Commercial Space Transportation has a two-fold mission: to ensure public safety during commercial launch and reentry activities, and to encourage, facilitate and promote commercial space transportation. To carry out our safety responsibilities, we develop and issue regulations, grant licenses, permits and safety approvals, and conduct safety inspections during each and every licensed or permitted launch.

We are also responsible for licensing the operation of launch and reentry sites, or spaceports, as they are popularly known. Since 1996, we have licensed the operation of eight different spaceports around the country.

I am very proud of the men and women who work in our office and of our outstanding safety record. Since 1989, we have licensed 205 launches without any loss of life, serious injuries or significant property damage to the general public.

Currently, as you know, the United States must rely on other nations to deliver supplies to our astronauts onboard the International Space Station. Over the next several months, two different American companies, SpaceX and Orbital Sciences Corporation, are planning to demonstrate their ability to take on that responsibility. Those missions will be licensed by the FAA. And we are working with both companies and with NASA to ensure their success.

While it may well be several years before we see U.S. rockets carrying people again all the way to orbit, there is plenty of work going on right now that is aimed at ending our reliance on foreign entities to transport crew members to and from the International Space Station. American companies are eager to show that they can do the job as part of the Commercial Crew Development program. The FAA is working directly with the interested companies and with NASA to ensure public safety during those launches whenever they take place.

Suborbital space tourism represents another important segment of the industry. Several companies are currently in the process of designing, building and testing vehicles that will be capable of carrying people up to the edge of space with maximum altitudes in excess of 100 kilometers. Based on market studies, we expect to see this type of activity result in a billion-dollar industry within the next 10 years.

To support these and other activities, the President's fiscal year 2013 budget request for our office is \$16.7 million, which provides for the equivalent of 73 full-time employees. Our fiscal year 2013 request represents an increase of \$429,000 over our fiscal year 2012 enacted budget.

Based on industry launch manifests and planned flight test programs, we are forecasting a significant increase in launch and reentry operations in 2013. We are also performing initial safety analyses for some of the new launch systems that are planned to be operational next year. The FAA stands ready to support our future in commercial space transportation. With your help and leadership, that future will not only inspire the Nation, it will also cre-

ate new jobs, produce new technologies and expand our reach into the universe.

Again, I am honored by this opportunity to come before you today, and I look forward to answering any questions that you may have.

[The prepared statement of Dr. Nield follows:]

PREPARED STATEMENT OF DR. GEORGE NIELD, ASSOCIATE ADMINISTRATOR FOR  
COMMERCIAL SPACE TRANSPORTATION, FEDERAL AVIATION ADMINISTRATION

STATEMENT OF DR. GEORGE C. NIELD, ASSOCIATE ADMINISTRATOR FOR  
COMMERCIAL SPACE TRANSPORTATION OF THE FEDERAL AVIATION  
ADMINISTRATION, BEFORE THE HOUSE COMMITTEE ON SCIENCE,  
SUBCOMMITTEE ON SPACE AND AERONAUTICS, ON THE OFFICE OF  
COMMERCIAL SPACE TRANSPORTATION'S FISCAL YEAR 2013 BUDGET REQUEST,  
MARCH 20, 2012.

Chairman Palazzo, Ranking Member Costello, and Distinguished Members of the Committee:

Thank you for allowing me the opportunity to meet with you today to update you on the ongoing activities in commercial space transportation by the Federal Aviation Administration (FAA), as well as some of the recent developments in this area.

We are all well aware of the historic change that has taken place in the U.S. space program with the retirement of the Space Shuttle. We watched with mixed emotions as Atlantis lifted off the pad for its final mission on July 8 of last year. That final mission left many wondering about the future of space transportation in this country. While it is certainly true that the launch marked the end of an era, it also represented the beginning of what I am confident will be an exciting future in space for our nation. Today, I would like to give you my perspective on that future and to highlight some of the ways that the FAA and the U.S. commercial space transportation industry are dealing with the challenges that we will be facing in the years ahead.

The FAA Office of Commercial Space Transportation (AST) was established in 1984. Our two-fold mission is to ensure protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch and reentry activities, and to encourage, facilitate, and promote commercial space transportation. To carry out our safety

responsibilities, we develop and issue regulations; grant licenses, permits, and safety approvals; and conduct safety inspections during every licensed or permitted launch.

We are also responsible for licensing the operation of launch and reentry sites or "spaceports," as they are popularly known. Since 1996 we have licensed the operation of the California Spaceport at Vandenberg Air Force Base; Spaceport Florida at Cape Canaveral Air Force Station; the Mid-Atlantic Regional Spaceport at Wallops Flight Facility in Virginia; Mojave Air and Space Port in California; Kodiak Launch Complex on Kodiak Island, Alaska; the Oklahoma Spaceport in Burns Flat, Oklahoma; Spaceport America near Las Cruces, New Mexico; and Cecil Field in Jacksonville, Florida.

I am very proud of the men and women who work in AST and our outstanding safety record. Since 1989, we have licensed 205 commercial launches without any loss of life, serious injuries, or significant property damage to the general public. We conduct safety inspections to ensure licensees and permittees are adhering to regulatory requirements. Inspections include at least one annual inspection at commercial launch site operations and at least one inspection of launch operations at time of flight. In addition to inspections, AST activities in support of Department of Transportation safety goals include granting licenses, experimental permits, and safety approvals, developing and issuing regulations, performing accident investigation and prevention activities, and supporting federal range operations and related aircraft traffic management. Safety inspection is an AST core function that involves the monitoring of all licensed and permitted commercial space transportation activities. These activities include those conducted by the licensee/permittee, its contractors, and subcontractors. All AST safety inspectors are

credentialed and carry their credentials during inspections. These inspectors use approved safety inspection plans, templates, and checklists to conduct and document inspections. A safety inspection encompasses more than flight activities alone. Inspectors also monitor and participate in mission dress rehearsals, safe and arm checks, flight termination system installation and checkout, accident investigation, and other activities related to public safety. The program is built upon a firm foundation comprised of written documentation developed by AST. Inspections are coordinated with other relevant and appropriate Agencies.

Licensing is an AST core function that fulfills statutory mandates and regulatory requirements that are designed to ensure public health and safety, safety of property, and compliance with U.S. foreign policy and national security requirements. Licensing includes policy and payload reviews to ensure that the proposed activity does not adversely affect U.S. foreign policy or national security interests.

Looking forward, one of the most significant impacts of the Shuttle retirement is that currently, the U.S. must rely on other nations to deliver supplies to our astronauts onboard the International Space Station. Over the next several months, two different American companies, SpaceX and Orbital Sciences Corporation, are planning to demonstrate their ability to take on that responsibility. Those missions will be licensed by the FAA, and we are working closely with both companies, and with NASA, to ensure their success.

While it may well be several years before we see U.S. rockets carrying people all the way to orbit, there is plenty of work going on right now that is aimed at ending our reliance on foreign

interests to transport crewmembers to and from the International Space Station. American companies are eager to show that they can do the job as part of the Commercial Crew Development Program. The FAA is working directly with these companies, and with NASA, to ensure public safety during those launches, when they take place. Over the next few years, we expect to see several abort tests being conducted, followed by uncrewed demonstration launches of the vehicles being designed for the commercial crew mission.

The FAA is also actively engaged in collaborative planning for suborbital operations. As part of the Flight Opportunities Program, NASA recently awarded contracts to seven different companies six of which are developing reusable launch vehicles that are capable of carrying various science or technology payloads on suborbital missions. Once the program gets underway, NASA hopes to be able to conduct those missions, under FAA licenses, as often as once per week, depending on payload demand for flights and flight opportunities program and funding level.

Space tourism represents another important segment of the industry. Several companies are currently designing, developing, and testing vehicles that will be capable of carrying people up to the edge of space, with maximum altitudes in excess of 100 kilometers. Based on market studies, we expect to see this type of activity result in a billion dollar industry within the next 10 years.

States and local agencies are also continuing to approach our office with proposals for the development of commercial spaceports, with tenants ranging from NASA, to the military, to

private industry. These groups recognize the potential for jobs and economic development that could result from growth in our nation's aerospace activities.

The President's FY 2013 budget request for FAA AST is \$16.7 million and provides for 73 full-time employees (FTEs). Our FY 2013 request represents an increase of \$429,000 over the FY 2012 enacted budget. The request includes \$15.7 million for core business operations. It also includes \$1 million for industry-based research and development and science, technology, engineering, and mathematics (STEM) education through the Center of Excellence for Commercial Space Transportation. The Center of Excellence was established to encourage the teaming of resources and capabilities from academia, industry, and government to focus on research areas of primary interest to the FAA and to the U.S. commercial space transportation industry.

AST is currently administering 14 active launch and reentry licenses for launches of Pegasus, Taurus (now called Antares), Atlas V, Delta IV, Delta II and Falcon 9. There are currently eight active licenses for launch site operations and two license amendments submitted for significant launch site license modifications. Based on industry launch manifests and planned flight test programs, AST forecasts a significant increase in launch and reentry operations in 2013. This forecasted increase reflects a higher flight rate by experienced launch operators under multi-launch operator's licenses from existing spaceports and launch sites, and new launch licenses and permits for newly-developed launch systems and proposed commercial spaceports. AST is already performing initial safety analyses for some of the new launch systems planned to be operational in 2013.

The greater activity levels in the commercial space transportation industry will result in significant increases in the corresponding number of licenses evaluated and issued, environmental assessments, safety analyses, and safety inspections for our office. To meet these increased workload demands, AST is planning to employ several additional flight safety and operations experts. This will allow us to double the number of our staff assigned to operational safety oversight functions in our field offices at Cape Canaveral in Florida; in Houston, Texas; Mojave and Vandenberg AFB, California; and Wallops Flight Facility in Virginia. It will also allow us to increase the number of simultaneous safety analyses we can perform.

We will also be collaborating within the FAA to ensure commercial space transportation requirements and operating characteristics are effectively captured within the evolving NextGen system requirements and that commercial spaceflight operations (both orbital and suborbital) are safely integrated with the National Airspace System (NAS).

AST's FY 2013 request also provides for focused operations to address the emergence of commercial human spaceflight and related technological and infrastructure needs. Operational safety oversight of human spaceflight will require developing technical expertise in several new areas including environmental control, life support, and crew survivability. To date, AST's launch safety oversight experience and authority has been primarily focused on uncrewed launches of satellites into orbit using expendable launch vehicles. Regulatory standards governing human spaceflight will evolve as the industry matures so that regulations neither stifle technology development nor exposed crew or spaceflight participants to avoidable risks. In accordance with the new FAA reauthorization language, the FAA will continue to work with

industry to explore these areas, but will refrain from proposing regulations to protect persons on board during the learning period until October 1, 2015.

The FAA stands ready to support our national interest in the future of commercial space transportation. Space exploration is a great American story. Our history in space has been dynamic, often innovative, sometimes tragic, but always courageous and ultimately triumphant. And with your help and leadership, that great American story will not only continue to unfold in our favor; but it will also create new jobs, produce new technologies, and expand our reach into the deep unknown of the universe. Again, I am honored by this opportunity to come before you today, and I am happy to answer any questions you may have.

Chairman PALAZZO. Thank you, Dr. Nield.  
I now recognize Captain Trafton for five minutes to present his testimony.

**STATEMENT OF CAPTAIN WILBUR C. TRAFTON, USN (RET.),  
CHAIRMAN, COMMERCIAL SPACE TRANSPORTATION  
ADVISORY COMMITTEE**

Captain TRAFTON. Thank you, Chairman Palazzo, Congressman Costello and Members of the Subcommittee. I appreciate the invitation to participate in this hearing today regarding the FAA AST budget request for 2013.

I am here in my role as Chairman of the Commercial Space Transportation Advisory Committee, as you know. COMSTAC provides information, advice and recommendations to the Administrator of the FAA within the Department of Transportation on critical matters concerning the U.S. commercial space transportation industry.

COMSTAC membership is made up of senior executives from the commercial space transportation industry, representatives from the satellite industry, both manufacturers and users, state and local government officials, representatives from firms providing insurance, financial and legal services for commercial space activities, and representatives from academia, space advocacy organizations and industry organizations. We meet twice a year in May and October in Washington, D.C., in a public forum. The primary goals of this Committee are to evaluate economic, technological and institutional developments relating to the U.S. commercial transportation industry, provide a forum for the discussion of problems involving the relationship between industry activities and government requirements, make recommendations to the Administrator on issues and approaches for federal policies and programs regarding the industry.

The commercial space industry represents the spirit and roots of America, exploration and entrepreneurship. The commercial industry plays an important role in stimulating investment in infrastructure and creating opportunity, jobs and ultimately a U.S. capability, increasing value to the U.S. taxpayer. This role is increasingly important as commercial space passenger travel emerges as a new business.

I am not going to read the rest of the statement. I thought the questions that were asked of me in the invitation letter, are right on the mark, and I have answered them as you can see to the best of my ability, and the Committee's ability.

A few wrap-up remarks. Commercial space is here to stay. There are those, particularly some astronauts, who don't agree with that, and everyone is entitled to their opinion. I found it interesting on 60 Minutes Sunday night that they only chose two astronauts who don't like commercial space and didn't choose a couple who feel the other way. Some areas requiring immediate action, and this is from COMSTAC, and I will be prepared to answer your questions and discuss these with you: cooperation with NASA, regulations, cargo missions, crew missions, who regulates, who operates, AST resources, does AST have the resources to handle the workload that is coming, and there is an increase in workload coming, indem-

nification, it has to be extended at least for a year. On balance, that is the best thing for the industry, for the country, and we at COMSTAC would just like to get that behind us as soon as possible.

On-orbit authority I understand where the Committee is coming from but everybody in the room needs to understand that once on-orbit authority is given, AST isn't going to be able to suddenly step up with regulations, policies. It is going to be several years before AST is up to speed in regulating the industry.

Export controls need some work, and I am prepared to discuss that.

I think that the entrepreneurs that are working the suborbital world are doing a great thing for our country, and I will say the United States, Russia, China and SpaceX, if you watched the other night, think about that. Three countries and one U.S. company have put a capsule up and then brought it back to Earth.

That completes my remarks, sir, and I am ready to answer your questions.

[The prepared statement of Captain Trafton follows:]

PREPARED STATEMENT OF CAPT. WILBUR C. TRAFTON (USN RET.), CHAIRMAN,  
COMMERCIAL SPACE TRANSPORTATION ADVISORY COMMITTEE

**Testimony of CAPT Wilbur C. Trafton, USN (Ret)**  
**Chairman, Commercial Space Transportation Advisory Committee (COMSTAC)**  
**To: House Science Committee, Subcommittee on Space and Aeronautics**  
**Topic: FAA/AST 2013 Budget Request**  
**March 20, 2012**

**Statement**

I am here to testify in my role as Chairman of the Commercial Space Transportation Advisory Committee (COMSTAC). Established in 1984, COMSTAC provides information, advice, and recommendations to the Administrator of the Federal Aviation Administration (FAA) within the Department of Transportation (DOT) on critical matters concerning the U.S. commercial space transportation industry. The economic, technical, and institutional expertise provided by COMSTAC members has been invaluable to FAA/AST's work in developing effective regulations that ensure safety during commercial launch operations and policies that support international competitiveness for the industry.

COMSTAC membership is made up of senior executives from the commercial space transportation industry; representatives from the satellite industry, both manufacturers and users; state and local government officials; representatives from firms providing insurance, financial and legal services for commercial space activities; and representatives from academia, space advocacy organizations, and industry associations. COMSTAC meets twice per year, in May and October, in Washington DC, in a public forum.

COMSTAC is governed by the Federal Advisory Committee Act, P.L. 92-463; implemented through 41 CFR Parts 101-6 and 102-3, Federal Advisory Committee Management; Final Rule; DOT Federal Aviation Administration Order 1110.30C, Committee Management; and the COMSTAC Charter, DOT/FAA Order 1110.124F.

The primary goals of COMSTAC are to:

- Evaluate economic, technological and institutional developments relating to the U.S. commercial space transportation industry.
- Provide a forum for the discussion of problems involving the relationship between industry activities and government requirements.
- Make recommendations to the Administrator on issues and approaches for Federal policies and programs regarding the industry.

The commercial space industry represents the spirit and roots of America: exploration and entrepreneurship. The commercial industry plays an important role in stimulating investment in infrastructure and creating opportunity, jobs, and ultimately a U.S. capability, increasing value to the U.S. taxpayer. This role is increasingly important as commercial space passenger travel emerges as a new business.

My responses to the committee's questions are attached.

**Responses to Questions**

- 1) *How would you rate FAA/AST's effectiveness as a regulator of the commercial launch industry, and do you believe they have sufficient resources to carry out their role?*

The Federal Aviation Administration (FAA) Office of Commercial Space Transportation (AST) is the U.S. government organization responsible for regulating the safe operations of the U.S. commercial space transportation industry and facilitating its international competitiveness. FAA/AST has effectively regulated the commercial space industry for 28 years. FAA/AST, through its charter, is designated to exercise this regulatory authority, having licensed or permitted over 200 launches since 1989 and, as of 2010 licensed eight spaceports in seven states. No bodily injury or property damage to third parties has occurred as a result of these licensed and permitted activities. Its licensing responsibilities include expendable and reusable orbital launch vehicles and suborbital launch vehicles.

FAA/AST is also an effective advocate for the commercial space industry. Its unique charter allows them to facilitate and promote the advancement of the industry. For example, the office just held the 15<sup>th</sup> annual Commercial Space Transportation Conference, an annual event that brings together diverse stakeholders in the space community to discuss and collaborate on important issues facing the industry and government agencies.

FAA/AST synthesizes the best practices of NASA, the Air Force, the aviation industry, and the space industry and is the most capable and well-staffed organization to fulfill its regulatory and advocacy roles. FAA/AST should remain funded and resourced accordingly.

- 2) *Looking forward the next five years, what do you consider to be the biggest challenges FAA/AST must confront in order to adapt to a changing industry? How confident are you that AST will be able to meet them?*

The biggest challenge, and opportunity, facing FAA/AST is continuing to fulfill its regulatory and promotion role as the industry evolves to include commercial passenger space travel. This requires an open and ongoing dialogue with industry players as well as with NASA (see question 3).

To ensure an open dialogue on safety, especially passenger safety, there needs to be a transparent exchange of data between industry and government, such that industry can be as aware as possible of lessons learned that can help it be safer. COMSTAC has encouraged the FAA to develop a process for disclosing pertinent data from reported safety-critical anomalies, mishaps, incidents, and precursors, where relevant to current and future operations. Such a process needs to protect proprietary data and comply with relevant export control policies while still fostering the continuous safety improvement of the industry. This is an important step in the dialogue between industry and government prior to any rule-making. FAA/AST has accepted this recommendation.

Another challenge is continuing to ensuring stability of the space launch industry via support of indemnification. The current space launch indemnification regime expires on December 31, 2012. As previously stated in reports by COMSTAC and The Aerospace Corporation, indemnification provides critical support for the U.S. launch industry. As an example, foreign launch operators have benefit of indemnification and this affords them a competitive advantage. COMSTAC has consistently recommended renewal and extension of this regime and again encourages the regime to continue. This issue needs to be addressed prior to the end of this year.

Counterproductive export control regulations continue to damage the U.S.'s ability to compete internationally and are resulting in thousands of jobs being sent overseas. Moreover, these obsolete regulations are actually making America less safe by eliminating critical domestic aerospace capabilities and preventing the government from focusing scarce resources on technologies that really do require enhanced protection. COMSTAC has consistently expressed its views that export control reform is needed.

FAA/AST is positioned to meet these challenges and will continue to have input from industry through COMSTAC.

- 3) *NASA is implementing a program to stand up a new commercial crew launch industry to serve agency needs, as well as foster development of a purely commercial market. In your view, how well are FAA/AST and NASA working together to ensure a workable regulatory framework?*

FAA/AST and NASA have been actively collaborating for many years to ensure U.S. government coordination and communication on space launches and to incorporate best practices in the industry. NASA is not a regulatory agency, nor does it want to be a regulatory agency. FAA/AST's charter assigns this role to FAA/AST, and they have effectively and safely executed this mandate for 28 years.

Collaborative discussions between NASA and FAA/AST, specifically on commercial crew, have been taking place for over a year, and include activities such as rotational assignments between the two agencies and support of definitions for crew and participant safety and for safety certification requirements development. Both agencies are working to ensure compatibility between NASA requirements and FAA regulations.

Commercial crew is new territory for the entire industry, and the most important point is for FAA/AST and NASA to continue the dialogue on creating a workable regulatory framework. This will take time and input from many stakeholders, including industry.

In July 2010, COMSTAC submitted two recommendations to FAA/AST on this subject, as a result of input and deliberations from the May 2010 COMSTAC public meeting:

1) Support for "Commercial Crew"

*The COMSTAC strongly supports the proposed Commercial Crew Development Program as contained in the FY2011 President's Budget Request for the National Aeronautics and Space Administration (NASA) to accelerate the development of commercial human spaceflight capabilities for access to low Earth orbit and to transition to private industry the transport of crew and logistics to the International Space Station. Working with the private sector, NASA can enable the development of safe, reliable commercial human spaceflight capabilities that will meet U.S. government needs, allow NASA to focus on exploration beyond low Earth orbit, and reap significant economic and other benefits to the nation's space industrial base.*

2) FAA Licensing of Commercial Human Spaceflight Activities

*A single, consistent regulatory and licensing regime for both government and non-government customers is critical to the long-term success of commercial human spaceflight providers and to enable the development of new customers and markets for private human spaceflight capabilities. The COMSTAC strongly supports FAA licensing of commercial human spaceflight activities, including those commercial activities conducted for the National Aeronautics and Space Administration (NASA), as consistent with current practice under the Commercial Orbital Transportation System (COTS) and Commercial Resupply Services (CRS) programs. Any customer, including NASA, can impose additional safety requirements and approval processes by contract.*

These recommendations remain valid.

**About COMSTAC**

COMSTAC provides information, advice, and recommendations to the Administrator of the Federal Aviation Administration (FAA) within the Department of Transportation (DOT) on matters concerning the U.S. commercial space transportation industry.

[http://www.faa.gov/about/office\\_org/headquarters\\_offices/ast/advisory\\_committee/](http://www.faa.gov/about/office_org/headquarters_offices/ast/advisory_committee/)

The Commercial Space Transportation Advisory Committee (COMSTAC) was established in 1984. Since that time, COMSTAC has provided information, advice, and recommendations to the Department of Transportation and the Administrator of the Federal Aviation Administration on the critical matters facing the U.S. commercial space transportation industry. This has allowed the FAA/AST to play a key role in the development of US aerospace programs. The economic, technical, and institutional expertise provided by COMSTAC members has been invaluable to the FAA/AST's work in developing effective regulations that ensure safety during commercial launch operations and policies that support international competitiveness for the industry.

COMSTAC utilizes working groups, which provide information, reports, and recommendations to the full Committee for adoption. COMSTAC has four working groups: Operations, Systems, Business/Legal, and Export Control. The Committee also establishes ad hoc working groups and special task groups to address specific issues as needed.

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COMSTAC meets twice per year, in May and October, in Washington DC, in a public forum.

**Biography of CAPT Wilbur C. Trafton, USN (Ret)**

Chairman, Commercial Space Transportation Advisory Committee (COMSTAC)

Mr. Trafton is President of Will Trafton & Associates LLC, an aerospace consulting firm. Previously he served as Executive Vice President of Rocketplane Kistler after the merger of Rocketplane and Kistler Aerospace Corporation. At Kistler Aerospace Corporation he held the position of President and Chief Operating Officer. Prior to joining Kistler, Mr. Trafton was Vice President / General Manager of Boeing Expendable Launch Systems and President of Boeing Launch Services. He served as Chairman of the Board and President of Sea Launch Company, LLC. He was also President of International Launch Services. Mr. Trafton is a former Associate Administrator for Space Flight at NASA Headquarters in Washington DC, where he was responsible for planning, budgeting and execution of the Space Shuttle Program, and the Deep Space Network. He was also responsible for four NASA centers; Johnson Space Center in Houston, Texas, Kennedy Space Center, Florida, Marshall Space Flight Center in Huntsville, Alabama, and Stennis Space Center in Mississippi. In 1997 Mr. Trafton was selected for Presidential Rank of Meritorious Executive. He was also awarded two NASA Outstanding Leadership Medals. Prior to joining NASA Mr. Trafton was President of Micro Research Industries, a software development company.

Mr. Trafton retired from the United States Navy as a Captain after 26 years of service. He is a decorated combat veteran, having flown 85 combat missions from the aircraft carrier *Shangri-la* in the Vietnam War. He also served as Commanding Officer of the fast combat support ship *Seattle* in Desert Storm. He was awarded the Bronze Star for his duty in Desert Storm. He held a number of high level positions in the areas of operations, acquisition of weapons systems, and international affairs, including Squadron Commanding Officer, and advisor to the Chairman, Joint Chiefs of Staff. He has over 3000 flight hours and 700 carrier landings.

A graduate of the U.S. Naval Academy, he received a Master's Degree in Operations Research and Systems Analysis from the U.S. Naval Postgraduate School in Monterey, California. He is also a graduate of the Defense Systems Management College in Ft. Belvoir, Virginia.

Chairman PALAZZO. Thank you, Captain Trafton. I thank the panel for their testimony, reminding Members that Committee rules limit questioning to five minutes. The Chair will at this point open the round of questions. The Chair recognizes himself five minutes.

Dr. Nield, this is actually a three-part question. What will be AST's approach to regulating orbital and suborbital crew launch systems? How will AST's regulatory regime differ from requirements NASA imposes on launch systems that may be contracted to carry NASA astronauts? And finally, will AST's approach distinguish between orbital and suborbital launch systems or will it be the same basic set of requirements? And I will go back to the first question, the first part. What will be AST's approach to regulating orbital and suborbital crew launch systems?

Dr. NIELD. Thank you, Mr. Chairman. Our approach for overseeing the launches that we have coming up consists of looking at both the impact on public safety and the impact on crew members and spaceflight participants. In terms of the public safety, we have our regulatory framework in place today. We have a good safety record. We have a licensing and permitting scheme that we believe has done a good job of ensuring their continued safety. What is new, as you point out, is carrying people onboard these rockets, and we have some very top-level regulations which Congress asked us to develop following the Commercial Spaceflight Amendments Act of 2004. However, in conjunction with that legislation and the recent FAA authorization, we were asked to hold off on additional regulations that were designed to ensure the safety of crew members or spaceflight participants until, as you mentioned, October 1, 2015.

So our approach at this point is to continue to work with industry, with NASA and with other key stakeholders to understand what kinds of things would make sense for a regulatory environment so that when the learning period is over, when we have gained additional experience in these types of flights. Then we would be prepared to put in place a regulatory system that is rational, would maximize our safety and would not be a burden to the industry.

In terms of what is different with NASA, NASA is free to impose whatever requirements it believes are appropriate for its NASA astronauts, and it can do that through the contracts that it has with industry. Our focus today is on public safety. We want to work with NASA, though, to make sure that none of our requirements are either conflicting or otherwise confusing the requirements that NASA wants to put in place. That will be very important to ensure that the government is consistent with its requirements.

In terms of the differences between orbital and suborbital, our basic approach is the same but because those environments are so different, I think we have the opportunity to be a little bit more methodical with suborbital space flight. That is a lot more like aircraft flight test where you are expanding the envelope, you can take it flight by flight, step by step in terms of the speeds, the altitudes and the amount of time that the crew and spaceflight participants are exposed to the hazards of space is relatively short. For orbital flights, once you have left the pad, you are going and it is

probably going to be days or even weeks that you are exposed to that harsh environment. So I think it will be very important that we have a good sense of requirements as we come up on orbital spaceflight. The suborbital flight, I think the framework that Congress has put in place with informed consent and a step-by-step evolutionary process will be very adequate.

Chairman PALAZZO. Dr. Nield, this question is also for you. On March 9, 2012, just 11 days ago, your office published in the Federal Register a request for proposals for the Space Transportation Infrastructure Matching Grants program. How would your office fund grant applications given there is no funding identified in fiscal year 2012?

Dr. NIELD. I believe that the spaceport matching grants program is a very effective program. We have given \$500,000 in each of two years in 2010 and 2011. The first year was specifically at the direction of the Congress. Last year and potentially this year, if we give out those grant funds, it would be basically taking out of our hide in terms of the amount that we already have available. But we think that the FAA has a very great model in terms of the Airport Improvement Grant program that is very successful in helping our national infrastructure to be modernized and fully equipped to meet our needs for aviation transportation. As we move forward with commercial space transportation, we think similar models—where you have matching grants, some federal funding and some from local or private entities—would enable us to maximize safety and help the national infrastructure to be prepared for the future.

Unfortunately, in the current tough economic times, we have to prioritize all of our activities, and so looking forward, you will notice that we are not asking for funding in 2013 for the grants program. We think it would make sense to continue to look at that in the future to see if that is something that we are able to accommodate, but we would not be able to give out grants in 2013, according to our current plans.

Chairman PALAZZO. But just to finish up, on the documentation that I am looking at, there is no money set aside for spaceport grants in 2012. So we are putting out a proposal for applications but there is no money available, or do you have money that has not been used from prior periods?

Dr. NIELD. So to answer that, in the Federal Register notice, we warned people that we may not be able to have funds available. However, we are carefully managing our resources this year as we go through the year to see if we might be able to have some small amount available.

Chairman PALAZZO. And were the funds available, in your view, would space transportation grants take priority over your other regulatory and safety responsibilities?

Dr. NIELD. I would have to say safety is number one, but the grants can be very important in terms of helping the industry to be safe and mature going forward.

Chairman PALAZZO. Okay. Thank you. My time is up.

Mr. Costello?

Mr. COSTELLO. Thank you, Mr. Chairman.

Captain Trafton, in your opinion, is the AST budget request for fiscal year 2013 adequate to carry out their mission?

Captain TRAFTON. Mr. Costello, yes, sir, I think it is. As I mentioned, we see a tremendous workload coming for AST. When one looks at the suborbital and orbital flights on the horizon, and yes, I know, that the numbers aren't there if you look back, but if you look forward, they certainly are there, and some companies are talking about flying 30 times a year, and when you put that package together and you look at all the pre-license issue work that needs to be done to lay the groundwork and the meetings and then finally issue the license and then follow the license, issuing a license isn't the end of their activity. So I think it is extremely important that AST be funded to perform their regulatory role and I absolutely think that their budget request for 2013 is justified.

Mr. COSTELLO. In your opinion, what should AST's priorities be for fiscal year 2013?

Captain TRAFTON. Well, Dr. Nield has already said it. The priority is safety always. The work with NASA, the collaboration with NASA is extremely important, and I have to say in the interest of full disclosure, I sit on the NASA Commercial Space Committee, and it has gotten very interesting. We never have a meeting on this committee or that committee that we don't talk about the relationship between NASA and the FAA, and it is interesting that we are of one opinion on both sides. The FAA will be the regulatory agency for crew and cargo missions, suborbital and orbital. Yes, we need to work the hard details with NASA but that is a given from these two committees.

Again, just looking forward, I can count 40 flights right on the horizon, five traditional ELVs, five cargo to ISS, 20 suborbital research and 10 Virgin Galactic, for example, tourism flights. So there's 40 right on the horizon. So I think they need to be plussed up.

Mr. COSTELLO. Thank you.

Dr. Nield, you made mention that in the FAA reauthorization, in the Act that was passed recently, the reauthorization, it postpones AST's ability to regulate until October of 2015, but there is a statement, of course, that is attached to that that does not prohibit AST from moving forward. So I guess my question is, what is AST doing at the present time regarding the authority that the reauthorization bill gives you?

Dr. NIELD. So we are still looking at that legislation and discussing it with our counsel to understand exactly what we can and cannot do. We very much appreciate the guidance from Congress that encourages us to work with industry because we believe that is very important to getting these regulations correct.

In terms of what we are doing right now, frankly, we are going through line by line all of the extensive requirements that NASA has developed for its own human rating requirement set, and we are looking at which of those would be applicable to non-NASA missions and we are going through for each discipline and trying to understand what would that look like if we weren't supporting NASA for the International Space Station. So that is a work in progress.

The worst thing that could happen, I think, would be for us to just sit back and when an accident occurs if we would scramble around and try to put some regulations in place. That is not the

right solution. So it is very important that we work with all the stakeholders—industry, NASA and the other interested parties—now to start developing what that regulatory framework would look like, and when it is right, then we will be ready to go forward.

Mr. COSTELLO. Thank you.

Finally, Captain Trafton, you make mention in your statement about recommendations for government and industry to share information and transparency, how important it is. I am pleased to hear you say that NASA and the FAA are working close together. On my other hat with the Subcommittee on Aviation of Transportation and Infrastructure, we had a problem when it came to trying to get agencies to work together concerning NextGen, and not always did we have the cooperation not only of the agencies working together but of the stakeholders working together. So I guess my question to you is, do you have a model in mind for a system to exchange data between the governmental agencies and industry?

Captain TRAFTON. No, sir. The short answer is no, I don't have a model in mind. We have discussed this subject at length within the COMSTAC. It is clear to us that there has to be an exchange of safety information. AST has a lot of safety background, experience, information that they can share as does NASA. So we know it is there. We know they need to share it. We have talked about in our recommendations to Dr. Nield but we don't have a model yet.

Mr. COSTELLO. Well, I hope sooner rather than later that there is a model that is developed, and as I said, I think as far as transparency and governmental agencies working together with private industry concerning NextGen, we had some bumps in the road early on but I think many of those have been worked out. So I hope we don't repeat that regarding this program.

So with that, Mr. Chairman, thank you.

Chairman PALAZZO. The Chair now recognizes Mr. Brooks from Alabama.

Mr. BROOKS. Thank you, Mr. Chairman.

Dr. Nield, I am looking at Committee staff notes, and they say "AST issued its first launch license in 1989 and since then has licensed 205 launches with no fatalities, serious injuries or significant damage to the uninvolved public." Is that an accurate statement?

Dr. NIELD. Yes, it is, Mr. Brooks.

Mr. BROOKS. And then they also give me notes that state that "During the previous year, only one launch license was issued." Is that correct?

Dr. NIELD. It depends on how you count the events and what fiscal years you are talking about. For example, this hearing is designed to look at the fiscal years, so if we look at the last fiscal year, 2011, then we had actually five launches of which three were licensed and two were permitted. So we have all those numbers available and can answer which particular question that you had in mind.

Mr. BROOKS. And if I understand it correctly, your budget request assumes dramatic growth in the launch rate during the coming fiscal year, noting that up to 40 launches and reentries could occur. Is that a fair characterization by Committee staff?

Dr. NIELD. Yes, sir, it is.

Mr. BROOKS. What is it that causes you to believe that we would have a jump of, say, five launches and two or three licenses up to as many as 40?

Dr. NIELD. The factors that go into that assessment are that this is a new and growing industry. If you look at the last 25 years, almost all the launches were for the same basic purpose: to launch a satellite such as a telecommunications satellite into orbit. And the level of business for that part of the industry is continuing today and we expect it will continue going forward without much change. But there are several new segments that we see just on the horizon that we think will greatly increase the activity, and so those include the commercial cargo flights to the space station to support NASA. That is something we have never had before. NASA has contracts for \$3-1/2 billion for those two companies to provide those 20 flights over the next few years, so we know that is going to start soon, probably this year. We have the commercial cargo flights, again in support of NASA. We also have the suborbital activities both for scientific research and for space tourism. And all of those segments are starting. We have got companies actually making designs, building hardware, assembling things and conducting tests. So exactly when those launches will start is hard to predict but it looks very, very clear that it is going to be in the next one to two years. So that is the basis for our projections.

Mr. BROOKS. With respect to fiscal year 2012, how many launches have already occurred that required oversight by the Office of Commercial Space Transportation?

Dr. NIELD. None so far.

Mr. BROOKS. So that would be none over the past five months?

Dr. NIELD. That is correct.

Mr. BROOKS. And we have seven more months in this fiscal year. How many launches are currently on the calendar with set dates?

Dr. NIELD. That is a great question. For industry, we don't have publicly published launch dates the way we are used to seeing them for government operations, but as we talk to the various companies, I think it is quite possible we will get to 10 to 12 launches by the end of the year, and—

Mr. BROOKS. So you think we will have 10 to 12 launches over the next seven months?

Dr. NIELD. Yes, sir.

Mr. BROOKS. Now, your budget, as I understand it, for fiscal year 2011 was roughly \$15 million. During that time frame, we have four or five launches, if I understand you correctly. And fiscal year 2012 enacted is a little over \$16 million, and if I understand it, you are now looking at eight, nine, 10, 11, 12, somewhere in that neighborhood, for the remainder of this fiscal year, although so far for the first five months we have had zero. And yet you are testifying that it is going to jump up to around 40, far more than historical averages, for fiscal year 2013, but you are having a requested only 2.6 percent increase in your budget. How is that going to work where you have a 2.6 percent increase in your budget request but you are looking at four times as many launches as the historical average?

Dr. NIELD. It is going to be a significant challenge. The way we hope to accomplish that is by working efficiently, by using this time when we have had few launches to set up the organization, to do training, to develop policies, to be ready to go so that when the activity starts to build, we are prepared to do that.

There are many different metrics that go into deciding how many resources we really need to accomplish the job. Launches is one of those but there are other things too—how many applications for licenses, how many for permits, how many field offices do we have, how many regulatory rulemaking activities are underway and so forth. So we have tried to develop a staffing model that will help us get a sense for that, and we are starting to use that to provide our request to the committee.

Mr. BROOKS. Thank you, Dr. Nield, and if the chairman will excuse me, I have got a concurrent Armed Services Committee meeting.

Chairman PALAZZO. Thank you.

The Chair now recognizes Ms. Edwards from Maryland.

Ms. EDWARDS. Thank you, Mr. Chairman, and thank you, gentlemen, for your testimony.

In a couple of iterations on this Subcommittee, I have had questions regarding liability and indemnification for commercial space launch, and so I want to focus on that for the time being.

Dr. Nield, the government-industry shared liability and indemnification regime for commercial launch systems, whether that is unmanned satellite launches or ones that could carry passengers under the Commercial Space Launch Amendments Act, is set to expire on December 31st of this year. What, if any, changes to the regime are needed in light of the evolution of commercial space transportation?

Dr. NIELD. That is an excellent question. With your permission, I would like to just talk a little bit about indemnification itself because—

Ms. EDWARDS. Just remember that I only have five minutes. Thank you, though.

Dr. NIELD. Okay. This is a very important question. Perhaps we can discuss it in further questions. To get right to the issue that you are asking about, the recommendations that COMSTAC, for example, has made relating to indemnification are that we consider having it renewed for more than a few years, perhaps ten years or even making it permanent, and lifting the cap, which is currently \$1-1/2 billion. So those are the specific changes that have been proposed that could improve the system but I think in general we definitely need to extend the regime, and there are a number of reasons for that which I would be happy to discuss further later.

Ms. EDWARDS. Let me just ask you that, and I apologize, I don't mean to cut you off. We just get these time limits and it drives us crazy. I am curious as to where the liability should be because—let us just separate unmanned from missions that would carry crew. Isn't it true that one part of that industry is fairly mature in terms of the technology? So why is it that on the commercial side, the taxpayers should basically enjoy pretty much all the risk and the companies engaged in the activity bear really not a lot of the risk?

Dr. NIELD. I would say that that would not be an accurate representation of the current situation. So if you go back to the terminology itself, the word "indemnification" really does not explain what the regime is that Congress has put in place. A more accurate assessment would be to call it a conditional payment of excess third-party claims. Now, briefly, what does that mean? It is conditional. Congress would have to appropriate funds after an accident before it would happen. It doesn't happen automatically. It is third party, so we are not talking about a wealthy space tourist getting reimbursed or his heirs. We are talking about protecting the general public's interest should they have damage or injury. And we are talking about excess payments. Our office does an assessment before each launch to develop a maximum probable loss, how much damage we think could happen during that launch. We set that as the amount of insurance that the company has to put in place and it is only if the accident exceeds that in terms of damage that this regime kicks in.

So with that as the basis to understand it, do we need it? Yes, we think it is necessary for industry to be internationally competitive, and what is the cost to the taxpayer? Well, it has been in place since 1988. The cost has been zero.

Ms. EDWARDS. But we are also entering a different environment for commercial launches too. It isn't the environment that we have been in since 1988. I mean, that is the whole premise of the budget that we are putting in place looking forward, and Captain Trafton's testimony and his belief is that there is a lot of fairly robust industry there, and so I guess although I understand the regime, my question just has much more to do with why is it that the industry itself fully doesn't bear the responsibility to the public in the event of an accident?

Dr. NIELD. I think it would be appropriate for Captain Trafton to respond, but my assessment is that this is a shared risk regime on purpose because of the high risk and the potential high damage that is involved.

Ms. EDWARDS. Captain Trafton?

Captain TRAFTON. Yes. Thank you, Ms. Edwards. First of all, as I stated earlier, COMSTAC would be perfectly happy if the Congress would extend indemnification for another year and then let us work the fine details, but we need it, and we need it to be competitive internationally. Everybody else has this. On balance, it is good for the United States, it is good for the U.S. industry, and it makes our industry competitive. And without it, our industry will suffer. Russia takes care of theirs. Europe takes care of theirs. China takes care of their launch providers. We need to do the same.

Ms. EDWARDS. Thank you.

Chairman PALAZZO. Thank you, and also for the Subcommittee's personal knowledge, we are going to be having a hearing on indemnification in late spring, the latter half of May, and we are hoping to have the GAO, who is conducting an extensive analysis of the market right now to be able to come be one of our witnesses.

At this time, the Chair recognizes Mr. Rohrabacher from California.

Mr. ROHRBACHER. Thank you very much. Just a little bit on limited liability, which is of course, I think, a very serious issue and should be discussed, but we should put this in perspective to new and developing industries as well as industries that we have. Certainly limited liability has been put in place for the nuclear industry, and we are about to step into a whole new era of nuclear power plants that are totally safe and will save our country. I mean, they will. But we would never have reached that stage if the early part of developing that industry if there wasn't limited liability. Let me note, we have limited liability for aviation for our airlines, and the airlines in the development of the airline business. That too I think we can be proud that we have come so far so quickly in the field of aviation.

And let us also note that if we don't want the government to run everything, the government has limited liability, I mean, in everything it does, and, you know, correct me if I am wrong, but I don't believe NASA can be sued, and it is part of the United States government. So if we don't look at limited liability as something that is part of what we want to do to develop this new commercial industry, which will save the taxpayers enormous amounts of money, limited liability has to be part of that discussion.

I was of course here and I am the author of the Commercial Space Launch Amendments Act of 2004, and I would like to note that we created a moratorium that we have on new restrictions to the industry to give the industry eight years not only to develop and design, test and evaluate new systems but also to gain significant flight experience. In addition, we designed this learning period to give ample time for the FAA to understand these systems and create needed regulations based on real data, not on speculation. At that time, if we had gone right into it, we would have been creating regulations and setting down the ground rules for things we didn't even know about yet because no one had ever done them. So what we need to do is to make sure that when we do get into this field, and I know there is an extension now of three more years, we haven't progressed as much as we thought we were going to, but after 3 more years, let us make sure in these years we get the data we need to make sure that regulation that is justified and the structure that these private companies can operate under that we set up something that is workable, workable and safe, and if it is not safe, it is not workable. We know that.

Just to get down to maybe things we might be doing, do you see NASA as a regulator of commercial launch systems, even in a situation when NASA is not the customer, doesn't bear any relationship to the economic deal that is being made?

Dr. NIELD. We are working very closely with NASA but in discussions with NASA leaders, NASA recognizes that they are not set up as a regulatory organization. That is the proper role for the FAA or similar agency. NASA has a lot of experience, a lot of expertise, and they are doing some great things, especially in exploration.

Mr. ROHRBACHER. Right. NASA has the leading role to play in space exploration. NASA has a leading role to play in pushing us and pushing back the frontiers. I don't see NASA as playing a leading role in regulating the economic activities of other entities in

space, and there is a significant difference between the regulatory mission of AST protecting the uninvolved public and the regulatory mission of most of the rest of FAA. So how does this influence your office and how it operates as compared to the rest of the FAA?

Dr. NIELD. Like the rest of the FAA, we are focused on safety and we have a lot of experience and expertise that we can take advantage of in trying to apply to these new activities. What is different, though, about our industry is, it is a new industry. We don't have 100 years' worth of experience such that we have developed all the lessons learned, all the factors to look at, and we want as a Nation to encourage innovation, creativity, and to figure out how we can build safer, more reliable, more cost-effective vehicles in the future. So that is the balance that we want to try to achieve. Safety is number one, but let us allow some innovation.

Mr. ROHRBACHER. Mr. Chairman, I would suggest that we have done what is right. Sometimes you look back and Congress has done exactly the wrong thing to achieve the goals that they have set out, but we are doing this in a very systematic way and within a few years we have seen this commercial space group expand and the amount of money coming in to space activities from the commercial side expand. So if we just keep on this very responsible approach, I think we will have a great new industry for this country and for the world that we will be proud of.

Thank you very much, Mr. Chairman.

Chairman PALAZZO. Thank you.

The Chair now recognizes Ms. Adams from Florida.

Mrs. ADAMS. Thank you, Mr. Chairman.

I want to go back to, some of my colleagues were asking you questions, and I am trying to understand your rationale for what you believe is going to be, I believe you said 10 to 12 launches over the next seven months. Because in 2009 you issued five experimental licenses to suborbital companies. In 2010, you issued four, and you issued zero in 2011. Your written testimony to this Committee in May of 2011, you stated "In fiscal year 2012, we expect several dozen licensed or permitted launches. Although most of those missions will involve suborbital launches, it still would be quite a change." Now, you said you are still expecting those several dozen, or now it is 10 to 12, so are you still expecting a dozen this year, launches this year?

Dr. NIELD. Yes, ma'am.

Mrs. ADAMS. How many licenses are currently on track to issue this year, for this fiscal year 2012?

Dr. NIELD. I don't have the number of licenses at my fingertips. I think it is important to look at the launches and the licenses as separate events. We can certainly get you that information.

Mrs. ADAMS. So you don't know how many licenses are on track but you still believe seven to—10 to 12 over the next seven months?

Dr. NIELD. Yes.

Mrs. ADAMS. But you can't quantify that with anything that you brought here today. Is that correct? Yes or no. I will move on to my other questions?

Dr. NIELD. It is a subjective issue. I am happy to give you my best guess.

Mrs. ADAMS. I would like to see some actual figures, if you could.

Dr. NIELD. We can get you that.

Mrs. ADAMS. That would be great. You know, the mission statement of AST is partially to encourage, facilitate and promote U.S. commercial space transportation. However, your mandate is to ensure the protection of public safety and property as well. Necessarily, this includes regulating and investigating violations of regulations in the industry. I have concerns about AST being both a regulator and a promoter of the commercial space industry. Can you tell the Committee your strategy to mitigate the conflict between these two parts of your mission as the commercial market continues to mature?

Dr. NIELD. Yes, I would be happy to. Safety is number one. That takes priority. We will never compromise safety. At the same time, in accordance with the guidance that Congress has given us, we are asked to encourage, facilitate and promote. So what does that mean? We do a number of different things. We try to collect and distribute information that we think is helpful to the industry, things like launch forecasts, economic impact assessments, various bits of information that we think could be a benefit to the companies that are actually working in the industry. We also put out documents or other reports that might be of interest to the industry. We hold pre-application consultations. We have workshops to help industry to understand our regulations and what we are expecting them to do when we license them. And then finally, we look at the environment in the interagency community working with NASA, working with the Congress, and to try to identify any particular obstacles to helping industry to be successful, and we think we can do all of those without compromising safety. So that is what we try to do.

Mrs. ADAMS. Well, obviously, NASA has extensive experience in putting people and things up into space. It is what they have been doing for decades. So can you tell the Committee how AST plans to ensure that they are not stepping on NASA's mission and what you are doing to ensure there are no overlaps between NASA safety guidelines under the Space Act Agreements during the CCDev and CCiCap programs and your safety requirements for licensure?

Dr. NIELD. Yes. We work very closely with NASA. Some of the things we have done are to assign our employees. We have one in the Commercial Crew Program Office at the Kennedy Space Center. We have other people nearby at Patrick Air Force Base. We have two at the Johnson Space Center in Houston. We have regular telecons with our NASA counterparts, and as I mentioned, we are going through the NASA requirements right now to try to understand which things should directly apply and which things may not be applicable to the commercial activities.

Mrs. ADAMS. Can you tell the Committee what AST is doing to work with the industry to ensure that everyone understands what you plan to do in the way of regulatory action?

Dr. NIELD. One of the prime things that we do is to work with our advisory committee, COMSTAC. We meet twice a year. We try to share our progress and invite their questions, comments or concerns so that we can address them in a quick and responsive way.

Chairman PALAZZO. Thank you. At this time we are going to move into a second round of questions. Mr. Costello.

Mr. COSTELLO. Mr. Chairman, thank you.

Captain Trafton, let me ask you about the dual role that the AST has in both regulating and promoting the industry. As you know, for many years the FAA had the responsibility of promoting commercial aviation as well as regulating commercial airlines, and because of conflicts along the way, the Congress as a result of those conflicts decided to change the role of the FAA, and instead of promoting commercial aviation, which we felt that the airlines could do very well on their own, that we did not need—the Federal Government did not need to be promoting commercial aviation. For the airlines, we said that you should be a regulatory agency and changed their responsibility. Do you have a concern about the dual responsibility of the AST?

Captain TRAFTON. Mr. Costello, at this time I don't. I don't see a conflict today in those two roles, and it is a fledgling industry, you heard. The industry I think can use the help from AST today. In fact, they sponsor in cooperation with AIAA an annual conference which was just held here in February, very well attended, great exchange of information. Both kinds of events are good for the industry. Now, down the road when the industry is more mature, absolutely, we should probably take a hard look at whether or not AST should be promoting commercial space.

Mr. COSTELLO. Thank you.

Thank you, Mr. Chairman.

Chairman PALAZZO. Dr. Nield, more and more we hear about manmade orbital debris and the threat it poses to satellites, the International Space Station and to crewed capsules. Going forward, what can be done to prevent the creation of additional orbital debris? And I guess I will ask what measures, if any, are space-ferrying nations considering to eliminate the creation of orbital debris and to what degree has your office looked at this issue?

Dr. NIELD. We have certainly looked at it. However, as you know, we actually do not have on-orbit authority today. Our Congressional authority is restricted to launch and reentry. However, because the on-orbit phase is while you are doing the mission, it is important to understand what is going on. There have been a number of international discussions about proposed guidelines of what altitudes are appropriate for various satellites, if there are certain lifetimes that should be enforced, but we currently do not have requirements in place today for our commercial providers along those lines.

Some of the things that you can do would be to carefully select the orbits that you are planning to fly to. Once the mission is complete, you could look at either reentering the satellite or boosting it up to a higher altitude so that you are not clogging up that orbital altitude with debris and used-up satellites.

Chairman PALAZZO. What about upper stages that are discarded upon launch?

Dr. NIELD. That is a source of a significant amount of on-orbit objects right now.

Chairman PALAZZO. Ms. Edwards, do you have a question?

Ms. EDWARDS. Thank you, Mr. Chairman. I will be very brief.

Dr. Nield, in your prepared statement, you note with regard to commercial human spaceflight that “Based on market studies we expect to see this type of activity result in a billion-dollar industry within the next 10 years.” Can you tell me what the basis is of your estimate and what percentage of that estimate involves purely private, non-government customers?

Dr. NIELD. Yes. All of it involves non-government private customers. The basis for the figure is actually a study that was done by the Futron Corporation in recent years, and rather than just going down the street and asking who would like to fly in space, they did a careful assessment of potential customers who had the disposable income or the savings that would be able to afford these rather expensive tickets these days and how many of them would be interested in flying if such a vehicle were made available, and so that would form the basis for a lot of these projections, and I would point out that Virgin Galactic, which is one of the companies that is involved in this right now, already has almost 500 people who have put down either partial deposits or paid for a full ticket, and that has raised \$60 million before the flights have even begun.

Ms. EDWARDS. If part of the estimate is people who would like to come—we heard claims that the industry has been expected to begin operations within a few years, in the next several years, but some companies haven’t even begun test flights yet, so I am curious as to how we can have confidence that the industry is going to grow to the level that you indicated, and on top of that, are we going to be—do we have to move to a point where we have a huge regulatory structure in place to handle an industry that we don’t know really is going to mature in the kind of way that a new regulatory agency and body and oversight responsibilities would entail?

Dr. NIELD. That will be a very big challenge, and we certainly want to work with the Congress as we make progress year by year in the industry to see do we have the right amount of resources, do we have the right level of regulatory oversight. Frankly, it is very hard to predict how many of these companies are going to be successful. We are dealing with a dozen companies right now that are planning to develop vehicles to be part of this industry but we know that all of them will not be successful. Some are going to run out of money. Some are going to find technical challenges. But there are enough good people and enough private funds and government programs that are investing in these areas that we are pretty confident that we are seeing the beginning of a significant upswing.

Ms. EDWARDS. Thank you very much. Thanks, Mr. Chairman.

Chairman PALAZZO. You are welcome.

I thank the witnesses for their valuable testimony and the Members for their questions. The Members of the Subcommittee may have additional questions for the witnesses, and we will ask you to respond to those in writing. The record will remain open for two weeks for additional comments and statements from Members.

The witnesses are excused and this hearing is adjourned.

[Whereupon, at 11:05 a.m., the Subcommittee was adjourned.]

## Appendix I

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ANSWERS TO POST-HEARING QUESTIONS

ANSWERS TO POST-HEARING QUESTIONS

*Responses by Dr. George Nield, Associate Administrator for  
Commercial Space Transportation, Federal Aviation Administration*

**Responses to Questions for the Record**

**Following the March 20, 2012 Hearing on the  
FAA Office of Commercial Space Transportation FY2013 Budget Request**

**Space and Aeronautics Subcommittee  
Committee on Science, Space, and Technology**

**Questions from Chairman Steven Palazzo**

**QUESTION 1: *Is FAA prepared to license the routine use of experimental aircraft (1) that may be used to train and/or familiarize paying customers as part of a preparation program for the eventual suborbital flight, and (2) will be used in the launch of suborbital customers? If yes, how would this be accomplished?***

The FAA's Office of Commercial Space Transportation (AST) has authority under 51 USC Chapter 509 to license the launch of a launch vehicle and the reentry of a reentry vehicle.

AST is prepared to license the routine use of experimental aircraft that will be used in the launch of suborbital space flight participants. Virgin Galactic approached the FAA proposing to operate both its carrier aircraft, WhiteKnightTwo, and suborbital rocket, SpaceShipTwo, solely under a reusable launch vehicle mission license. AST currently has the authority to license Virgin's proposed suborbital launches in their entirety, and it is prepared to license these routine operations.

AST does not have authority to authorize the use of experimental aircraft for operations such as maintenance flights, ferry flights, or flights for space flight participant training, when a launch is not intended. These types of aircraft operations are regulated by the FAA's Office of Aviation Safety (AVS).

It should be noted that current regulations do not allow flights of experimentally certificated aircraft to be conducted for compensation or hire. Further, there is no provision in the experimental category that would allow training of space flight participants. However, the FAA is prepared to consider requests for exemption to the compensation and hire rule for holders of a launch license to facilitate training and space launch operations with experimental aircraft. The FAA has created a team with members from AVS and AST to develop plans for effectively and efficiently regulating the aviation and space transportation elements and to map out the regulatory authority for these types of operations.

**QUESTION 2:** *With regard to the regulatory moratorium extension included in the recently-enacted FAA legislation, since your appearance before our Subcommittee on March 7, has FAA come to any further decisions on steps the agency can make prior to the moratorium's 2015 expiration?*

We plan to take the years through 2015 to dialogue with the commercial space transportation industry to exchange views and explore together the best ways to help new commercial human spaceflight activities be safe and successful. We believe that any future regulatory regime should be appropriately limited and targeted so as to enhance business growth. By working with the industry as well as NASA, we believe that a reasonable regulatory framework can be established.

The FAA's ability to share its thoughts about a regulatory framework is limited. We cannot propose rules until 2015, and opportunities for external discussions about potential rulemaking are limited. Absent relief from Congress regarding the moratorium, the FAA has only one avenue to work with industry on a more meaningful level, and that is through the issuance of guidance.

The issuance of guidance by the FAA is a means to share best practices for achieving safe human spaceflight and exchange views with industry. Guidelines are not draft regulations; nor are they a substitute for a regulatory framework. Discussions with industry of proposed regulations would require a statutory change.

**QUESTION 3:** *Orbital debris has become a major source of risk to satellites, the International Space Station, and future human crewed and robotic space vehicles. From a regulatory perspective, what actions can FAA take to mitigate the creation of debris, as well as alleviate the existing threat?*

Orbital debris has reached a tipping point in how the world views orbital safety. As a regulatory agency overseeing space activities, the FAA has been a major contributor in the efforts to mitigate orbital debris creation. Our current debris mitigation regulation focuses on preventing the creation of new debris. Through licensing support and analysis, the FAA oversees actions that launch operators must take to minimize the chance of an explosive breakup on-orbit. The current regulations have been effective at reducing the debris created by launch vehicle accidents but have not addressed the issue of debris already on-orbit. Adding massive upper stages into the congested orbits is a necessary part of space launch, but greater regulatory actions can and are being taken to improve orbital safety.

The level of global debris generation was fairly stable prior to a 2007 Chinese Anti-Satellite mission test. As a result of the destruction of the Chinese satellite and a collision between Iridium and Cosmos satellites the low Earth orbit debris population doubled. The FAA believes stronger positive regulation is needed to provide for safer on-orbit operations. The state of technology for US commercial space launch is sufficient to require more positive debris mitigation practices that are more closely aligned with the US National Debris Mitigation Guidelines. The FAA is currently working to update its debris mitigation regulation to provide

for better on-orbit safety without creating undue financial burdens on commercial launchers. These updated regulation efforts include greater collision avoidance provisions, stricter requirements for the disposition of spent upper stages, and limits on the amount of debris created in launch operations. The FAA is conducting cost/benefit analyses for these regulatory changes. It is encouraging to note that most US launch providers have advanced their systems sufficiently to comply with stronger debris mitigation rules. These updated regulations also better align commercial activities with civil and military US space as well as international debris mitigation activities.

Alleviating the existing threat of debris is a difficult task. The major risk factor for generating on-orbit debris is the collision of large objects. Launch vehicle upper stages and satellites are the most massive, and therefore, the largest source of orbital debris risk. Debris removal technologies are still undeveloped, so the best strategy is to plan for removal while a vehicle is still actively controlled. The FAA's rulemaking is considering requiring that upper stages be removed from the densest orbital areas. Removing the objects with the largest mass reduces the probability of the existing debris fracturing into significantly more debris.

***QUESTION 4: In the event of an anomaly or accident during a suborbital flight, what role would the National Transportation Safety Board (NTSB) play in any ensuing investigation? Does NTSB have the same relationship with AST as it does with the civil commercial passenger airline industry?***

AST has established a strong working relationship with the NTSB to familiarize the NTSB with the particulars of commercial space flight activities while developing plans for managing a mishap investigation as well as training and preparing the commercial space industry for a mishap. The AST Mishap Program Manager works directly with the NTSB on a frequent basis. Both the FAA and NTSB, in coordination with NASA, USAF, and commercial space flight companies have exercised mishap scenarios on a frequent basis at both the eastern and western launch ranges in order to determine roles and responsibilities in the event of a launch or reentry mishap. The NTSB will respond to a commercial space launch or reentry accident in a similar fashion to that in the commercial airline industry if the FAA declares an accident has occurred in accordance with established FAA regulatory definitions in 14 CFR part 400. These definitions for launch or reentry accident differ from the aviation regulations. There may be cases where the NTSB would choose not to lead a mishap investigation but would still have the authority to do so. The FAA is prepared to support an NTSB-led investigation or lead an investigation should the NTSB choose not to investigate.

**Questions from Ranking Member Jerry F. Costello**

**QUESTION 1:** *To what extent does AST require additional expertise to prepare for licensing and potential regulations associated with commercial human spaceflight operations and what is AST's plan for acquiring that expertise? What is your timetable for securing this expertise?*

AST has experience in many areas of aerospace engineering, especially with regards to large expendable rockets. Many AST personnel also have an aviation background as pilots or flight instructors, which is helpful in assessing hybrid launch vehicle operations that involve aircraft/rocket combinations such as SpaceShipTwo. Given the complexity and anticipated growth of human spaceflight (both suborbital and orbital), AST has concluded that additional expertise is required to provide public safety oversight and evaluation of human spaceflight operations, and eventually to develop regulations for occupant safety. Should additional resources be made available, AST's plan would be to recruit and/or contract hard-to-fill vacancies from the large pool of experienced engineers in Texas and Florida who are available as a result of the end of the Space Shuttle Program. Additionally, we plan to enhance in-house expertise through training, partnering and collaboration with NASA. Finally, we plan to utilize the Center of Excellence for Commercial Space Transportation to research specific human spaceflight topics to augment our staff's work. AST's timetable is dictated by available funding and by industry developments; because the first commercial human spaceflight activities are anticipated to begin in FY2013, the need is imminent.

**QUESTION 2:** *In his prepared statement, Capt. Trafton stated: "there needs to be a transparent exchange of data between industry and government, such that industry can be as aware as possible of lessons that can help it be safer. COMSTAC has encouraged the FAA to develop a process for disclosing pertinent data from reported safety-critical anomalies, mishaps, incidents, and precursors, where relevant to current and future operation.... This is an important step in the dialogue between industry and government prior to any rule-making. FAA/AST has accepted this recommendation." What is the status of FAA/AST's implementation of COMSTAC's recommendation?*

*a. Do you have a model in mind for a system to exchange lessons learned data between government and industry?*

AST shares the industry's view that ongoing sharing such information is vital to the growth of a safe industry. AST has already established a Commercial Space Transportation Lessons Learned (CSTLL) page on our website. Industry is encouraged to enter lessons learned on the site, and the information is then available to anyone who needs it.

The result has been less than satisfactory for several reasons, the most significant of which are: 1) the effort required by industry to enter data, and 2) the reluctance of most companies to share proprietary information (particularly "negative" information). The industry has expressed a desire for AST to collect the data, remove anything proprietary from it, and share it with industry.

AST is consolidating all of its databases (historical government, commercial, and current commercial) for safety trend analysis purposes. With some additional resources, we could post the information in the CSTLL. However, we do not currently have any way to “sanitize” the information in a way that would satisfy proprietary concerns. We have studied the aviation industry’s model, but have been unable to find a way to apply it to the CSTLL. The problem is that the commercial space transportation industry is very small, and each company is aware of the technical approach of all the others. Giving enough technical information on a problem to be worthwhile automatically identifies the source.

This is not a problem AST can solve unilaterally. We will continue to work with the COMSTAC to attempt to identify a solution.

**QUESTION 3: *The safety of occupants of commercial human spaceflight systems is treated at the present time through “informed consent”, where those occupants acknowledge that risks are associated with their travel.***

**a. *With operational suborbital flights expected to begin carrying humans in the near future, is informed consent still appropriate? If so, for how long?***

Informed consent is appropriate at least until the FAA can regulate the safety of commercial human spaceflight systems, and likely beyond. Human spaceflight will continue to be a hazardous activity for the foreseeable future, even with a regulatory agency overseeing its safety. Over time the level of safety and reliability achieved through experience, technological advances and regulations may be similar to common forms of public transportation such that informed consent is not necessary. That safety level is not likely in the foreseeable future.

**b. *Does informed consent cover any medical risks to spaceflight participants and, if not, how are those risks communicated?***

Yes. Under 14 CFR § 460.45, an operator must inform each space flight participant in writing about the risks of the launch and reentry, including each known hazard and risk that could result in a serious injury, death, disability, or total or partial loss of physical and mental function. This would include medical risks.

**c. *What do you consider to be reasonable alternatives to informed consent?***

Once industry reaches a level of safety and reliability commensurate with common forms of public transportation, informed consent may no longer be necessary.

**QUESTION 4:** *No single Federal agency has been granted the authority to regulate the safety of commercial spaceflight operations that take place in space and on-orbit.*

**a.** *What does the absence of a designated authority mean for the future of U.S. commercial human spaceflight?*

With the help of NASA's investment in commercial human spaceflight, U.S. industry plans to transport private individuals to Earth orbit in the near future. One U.S. company, Bigelow Aerospace, is planning to operate a private space station in Earth orbit sometime this decade.

The launch and reentry of private individuals to Earth orbit would require a license from the FAA. Although launch and reentry are particularly hazardous aspects of human space flight, many hazards still exist for crew and space flight participants during the on-orbit phase of flight. This is particularly true during rendezvous, proximity operations, and docking (or berthing) with another orbiting object.

Having federal oversight of the safety of occupants of commercial human spacecraft may enhance the safety of those occupants and should create a financial risk environment that will allow industry to succeed. Including the on-orbit phase in this oversight is necessary to secure these benefits.

Without a single agency responsible for human space flight, the various interests and responsibilities of many federal agencies and departments may result in conflicting requirements which could result in jurisdictional disagreements that have the potential to be a bottleneck for the industry.

**b.** *What are the implications of expanding or not expanding AST's authorities to include regulating the safety of on-orbit operations?*

Besides the effect on human space flight discussed above, unmanned space flight is also affected by the lack of on-orbit authority. Commercial vehicles will transit to and berth with the ISS and then return to Earth in 2012. Other on-orbit transportation vehicles such as space tugs and orbital debris removal vehicles have also been proposed by the private sector.

The orbital debris environment continues to worsen and there is much international activity directed at ensuring the long term sustainability of space. We believe that:

- 1) All government and private operators of spacecraft should follow common sense debris mitigation measures;
- 2) The government should oversee private spacecraft operators to ensure those common sense debris mitigation measures are followed; and
- 3) The Federal Communications Commission (FCC) and the National Oceanic and Atmospheric Administration are appropriate agencies to oversee private communications and remote sensing, respectively, but the FAA should oversee the transportation functions of private spacecraft.

Currently, the only government oversight of cargo transportation vehicles outside the vicinity of the ISS is by the FCC, which oversees communications. Expanding the FAA's authority to include regulating the safety of on-orbit operations of private cargo transport vehicles would close the current gap between launch and reentry and would allow the FAA to evaluate the safety of on-orbit activities. If a hazard was identified, the FAA would work with a license applicant to determine appropriate mitigation measures to minimize debris generation due to normal operations, explosions, and collisions. The FAA is sensitive to the potential cost and competitiveness impacts of any debris mitigation requirements and would not regulate ahead of international norms. Additionally, a single Federal agency would then be responsible for coordinating and overseeing the safety of spacecraft through all phases of execution, enhancing the efficiency of the process.

**QUESTION 5: *NASA was originally set to pursue traditional contracts for the design of integrated commercial crew transportation systems but recently switched to using Space Act Agreements.***

***a. What will be the implications of NASA's decision to use Space Act Agreements versus contracts on AST's responsibilities and activities for eventually regulating the commercial orbital human spaceflight systems?***

It is the FAA's understanding that NASA has determined that, under Space Act Agreements, NASA may not direct test activities performed by its commercial providers. Therefore, any rocket-powered test milestones performed under a Space Act Agreement must be licensed or permitted by AST. AST considers this an opportunity to partner with NASA and to begin to address key issues related to commercial orbital human spaceflight systems. It is not expected that any of these milestone flights will have occupants in the near term. These efforts will provide a learning period for AST prior to issuing occupant safety regulations.

***b. Under those circumstances, how does AST propose to gather sufficient data and information on specific crew systems to be able to carry out your licensing responsibilities?***

AST's licensing of unmanned launch systems provides AST information on vehicles. Additionally, because the crew is part of a flight safety system necessary for public safety, the FAA must obtain information regarding crew systems in order to ensure the safety of the general public. This will provide an additional source of data. Finally, AST plans to add expertise through recruitment, training, collaboration with NASA, and the use of the Center of Excellence.

**QUESTION 6:** *What would be the rationale for having the U.S. government extend third-party shared liability protection to the commercial human spaceflight industry, especially when the safety of commercial human spaceflight systems will not be regulated until at least October, 2015? Are there any examples of similar U.S. government protections provided for other adventure and entertainment industries?*

The rationale for having the U.S. government extend third-party shared liability protection to the commercial human spaceflight industry is the same as for the broader commercial space transportation industry. Without this protection, U.S. launch operators would be exposed to unlimited third party liability in excess of insurance arising from licensed launch activities. U.S. launch operators are reluctant to expose themselves to such liability, and it is the FAA's understanding that the capacity is not always available.

14 CFR Chapter 509's risk allocation regime is the best option for the U.S. government, the U.S. taxpayer, and the U.S. commercial launch services industry now and for the foreseeable future. Private insurance markets are still not able to provide full liability coverage to the commercial launch industry. Risk-sharing schemes are also standard practice internationally

The FAA notes that Chapter 509 charges it to protect the public, or, as characterized in the financial responsibility context, third parties. Accordingly, for purposes of public safety, the FAA may oversee the safety of commercial human space flight systems under current law. The FAA is limited in its ability to oversee the safety of those on board. They are not considered third parties See 14 CFR 440.1 (definition of "third party").

To the extent this question seeks to ascertain whether there is a justification for limiting liability between a launch operator and a space flight participant, there may be cause. Liability exposure and the related litigation impose serious costs on industries. Costs include not only direct costs, settlement costs, and an inability to recoup costs associated with non-meritorious claims, but the inefficient reallocation of resources from productivity to defense of claims.

Liability protection for commercial entities flying space flight participants in the form of liability limitations or caps may serve useful purposes. Liability limitation could foster the development of the commercial space transportation industry through lower costs for insurance and liability exposure, increased market entry, and the increased availability of private capital, all of which are benefits related to increased certainty. For the United States, liability limitation could foster space-related economic activity and employment and enhance the international competitiveness of its industries. Just as importantly, it would support the Federal government's need for affordable access to low earth orbit.

Research shows that useful industries have suffered large-scale economic harm as a result of liability litigation. For example, the general aviation industry saw its annual sales drop from 18,000 in 1978 to 928 in 1994, with 100,000 jobs lost as a result of litigation exposure. The number of vaccine manufacturers plunged from 25 in 1967 to 3 by the mid-1980s, again as a result of liability losses. Congress responded to these unfortunate developments with the General Aviation Revitalization Act of 1994 and the National Childhood Vaccine Injury Act. One is a statute of repose, the other a no-fault compensation program. Other federal statutes limiting liability in one form or another include the Communications Decency Act, the Lawful

Commerce in Arms Act, the Foreign Intelligence Surveillance Act, the Price Anderson Act for nuclear power, and the Amtrak Reform and Accountability Act of 1997.

The examples given above are not for adventure and entertainment industries. However, it is inaccurate to characterize the commercial spaceflight industry solely as an adventure or entertainment industry. Much of the commercial market for commercial human spaceflight includes flying people and payloads in space for research and development.

*Responses by Capt. Wilbur C. Trafton (USN Ret.),  
Chairman, Commercial Space Transportation Advisory Committee*

Chairman Palazzo:

Given the diversity of vehicle designs under development by the suborbital industry, how confident are the members of COMSTAC that AST has the necessary expertise to effectively regulate their operations?

*FAA/AST has consistently demonstrated the depth of its knowledge of space vehicles, both orbital and suborbital, through its many years of issuing launch licenses and experimental permits, as well as licensing spaceports. COMSTAC is confident that FAA/AST has, and will have with continued funding, the necessary expertise to license and regulate suborbital activities.*

Congressman Costello:

1. What would be the rationale for having the U.S. government extend third party shared liability protection to the commercial human spaceflight industry, especially when the safety of commercial human spaceflight systems will not be regulated until at least October, 2015?

*Extending the current FAA liability risk-sharing regime and expanding FAA's regulatory scope for human spaceflight are separate issues. The liability risk-sharing regime applies to all commercial launches, whether manned or unmanned – including commercial launches of satellites for government customers (NASA/NOAA/DoD) and private sector customers (e.g., major satellite services companies). The risk-sharing regime involves limiting industry liability for mishaps impacting the public, as well as government property associated with launch site infrastructure. The regime must be extended beyond 2012, in order to keep U.S. launch companies' risk within manageable limits, so that they will not be burdened with costs that impair their international competitiveness or even driven to exit the marketplace altogether. In sum, extension of the regime is essential for a number of reasons, including protecting public safety, maintaining US technological superiority, and fostering the health of the US aerospace industry.*

*The separate issue of FAA's regulatory scope concerning human spaceflight involves determining whether this scope should be expanded beyond the protection of public safety (i.e., the safety of persons not involved in a launch). Expanded scope would entail regulation directly addressing the safety of human occupants of commercial vehicles. Current law precludes formal rulemaking activity of this kind until 2015. Although this issue is separate from the liability risk-sharing issue noted earlier, human spaceflight regulatory expansion is also very important. Protection of occupant safety will be a key enabling factor for an industry growth on the verge of major growth. Commercial suborbital human spaceflight is expected to begin in the next one to two years, and commercial human spaceflight to the ISS is anticipated soon thereafter.*

2. What, if any, challenges do you anticipate for FAA/AST's partnership with NASA going forward, and what are your perspectives on how those challenges should be addressed?

*FAA/AST, as the regulatory agency charged with overseeing public safety and fostering best practices for commercial spaceflight, has worked hard over the past few years to foster an atmosphere of co-operation with NASA. As NASA's role becomes less focused on Earth-to-orbit*

*transportation and more focused on research and exploration beyond Earth orbit, NASA will work even more closely with the commercial space industry, and with FAA/AST, to achieve NASA's own mission goals. The recent Memorandum of Understanding, between NASA and FAA/AST, underlines both the agencies' shared spirit of cooperation and their progress in defining a concrete framework of collaborative roles.*

3. What information do you believe Congress needs in order to have confidence in FAA/AST's readiness to issue regulations on the safety of humans on sub-orbital and orbital commercial human spaceflight systems?

*FAA/AST will be well-suited to provide all the information Congress needs to obtain, in order to have full confidence in the agency's ability to effectively manage expansion of its human spaceflight regulatory role. In general, AST must demonstrate in-depth knowledge of industry viewpoints on key issues. Clearly, the agency's intensive, ongoing communication with industry will ensure that AST will possess this knowledge. In addition, AST must demonstrate precise understanding of technical vehicle design and operational issues. Without a doubt, the agency will have such knowledge. AST's staff are highly skilled professionals with unparalleled experience, gained through studying commercial space flight systems in great detail when considering companies' license and permit applications.*

